Police
The No Action Alternative has no impact on the law enforcement support provided by the Bellingham Police Department, Whatcom County Sheriff and Skagit County Sheriff.

Schools
Timber harvests from Common School trust lands contribute funding for K-12 school construction. Forest Board contributions to the state general fund also provide support for local educational needs. The No Action Alternative would provide the greatest opportunity for timber management of the three alternatives.

Parks and Recreation Facilities
There are no parks or developed recreation facilities located on DNR trust lands. No direct impacts are expected to facilities located on adjacent public or private lands.

Communications
The No Action Alternative neither impacts communication site leases nor limits new site opportunities. DNR would continue to lease communication tower and building space, increase rental rates as market conditions allow, and seek new customers.

Water and Storm Water Management
The harvest levels proposed for this alternative will not significantly increase peak flows if the harvest pattern is evenly distributed over the planning area. Therefore there are no short-term, long-term, cumulative, or unavoidable impacts to bridges or the water intake for the Brannian Creek fish hatchery from peak flows. Consequently no mitigation measures are needed.

Sewer and Solid Waste Management
Sewer and solid waste management primarily affects residential and commercial areas. State trust lands in the Lake Whatcom planning area are slated for long-term resource use. Most of the DNR-managed property within the planning area has been designated as commercial forestland of long-term significance. Consequently, there is no significant need for or impact to sewer infrastructure under the No Action Alternative or either of the other two alternatives. Solid waste management on DNR-managed lands in the watershed is limited to cleanup of illegal garbage dumping, which is mitigated to some extent by the gated road system.

Preferred Alternative
The Preferred Alternative was developed by DNR and the Committee in a consensus process.

Natural Environment

EARTH

Approximately 8,276 acres of the 15,707 acres of trust land in the Planning Area would be available for timber harvesting under the Preferred Alternative. In addition, there are approximately 3,098 acres mapped as unstable areas (Watershed Analysis ARSs 1, 2, 3, and 4) where harvesting will either be prohibited or significantly restricted. There would be

approximately 802 acres of riparian buffer and 26 acres of wind buffer. Approximately 1,425 acres have been identified as possibly inaccessible for harvesting under this alternative.

About 43 miles of new road would be constructed during the next 60 years. No road construction would occur on unstable slopes, and almost no construction would occur on potentially unstable slopes. After abandonment of existing and constructed roads not needed for long-term use, a total of approximately 35 miles could be expected to remain as permanent active roads. An average of 43 acres of regeneration harvests and 35 acres of thinning would occur annually. There would be no harvesting on unstable slopes, and harvests planned on, or adjacent to, potentially unstable slopes would be evaluated on-site by a DNR slope stability specialist and reviewed by the inter-jurisdictional committee.

Unstable Slopes

Short-term: Direct Impacts – Indirect Impacts

The nature of potential impacts would be similar to the No Action Alternative. However, the likelihood of such impacts occurring would be reduced under this alternative due to more restrictive slope stability protection strategies plus substantial reductions in total miles of road to be constructed (30 percent) and acres of timber to be harvested (27 percent). No road would be constructed on unstable slopes and very little would be constructed on potentially unstable slopes.

Surface Erosion

Short-term: Direct Impacts – Indirect Impacts

The types and sources of potential impacts under the Preferred Alternative would be similar to those described for the No Action Alternative. The potential for surface erosion would remain insignificant under this alternative, but would be reduced slightly more from the No Action Alternative because less road construction and timber harvesting would occur on sensitive slopes.

Unstable Slopes and Surface Erosion

Long-term: Direct Impacts – Indirect Impacts

The type and duration of potential slope stability and surface erosion impacts would be similar to the No Action Alternative. However, the probability of such impacts occurring would be reduced because of more restrictive road construction and timber harvest strategies, and significantly reduced levels of road construction and timber harvesting. Also, the strategy under this alternative to implement and complete the road maintenance and abandonment plan within four years would ensure more timely correction of potential erosion problems on existing roads.

Cumulative Impacts

The potential for cumulative impacts would be reduced from the No Action Alternative. Most of the sediment deliverable to public resources would originate from existing roads, and these adverse impacts are not considered to be significant.

Mitigation – Landscape Plan Proposal

Paving roads and armoring road ditches to reduce erosion could further reduce sedimentation from roads.

Unavoidable adverse impacts
Road and landing construction could result in erosion and increases in sediment production, even if impacts were mitigated.

AIR

Climate/Air quality

Short-term impacts only, similar to the No Action Alternative, although the potential for impacts is lower due to reduced level of harvest activities.

WATER

Surface and Ground Water Quality

The Preferred Alternative differs from the No Action Alternative in terms of surface water quality by the addition of a few more mitigation measures. One of these is leaving buffers on the smaller Type 5 streams. For perennial streams, there will be more protection of water temperature. However, many of these streams are seasonal and are dry is the summer when water temperature is a concern. The buffers will help to reduce the amount of sediment entering the streams during and immediately following logging by preventing soil disturbance within the riparian areas. If there is a surface erosion source near a stream, the buffers will serve as a sediment filter.

Under this alternative, no road construction and limited reconstruction of existing roads will be allowed on slopes determined to be unstable. Consequently the risk of adding more sediment to surface waters because of mass wasting is reduced to some extent. The potential for impacts from roads may be reduced because about a third fewer road miles will be constructed than under the No Action Alternative. However, the relative difference is more dependent on location and construction techniques than on small differences in miles.

The regeneration harvest level for the Preferred Alternative is less than half of that for the No Action Alternative. Therefore the acres contributing elevated levels of soluble nutrients at any given time are so few (less than 215) that there will be no detectable increases in concentration or loads.

Although the Forest Practices Rules WAC 222-38 (WFPB, 2001) adequately prevent introduction of chemicals into surface waters, there is always a slight risk of an accidental contamination. The preferred alternative eliminates any risk by prohibiting aerial application of chemicals.

Surface and Ground Water Quantity

The regeneration harvest level for the Preferred Alternative will maintain average hydrologic maturity at approximately 90 percent of the forested land. Therefore there will be no measurable or significant impacts on water yield or peak flows.

Public water supply

The risk of sediment and phosphorus loading above natural background levels into Lake Whatcom is less under the Preferred Alternative than under the No Action Alternative.

PLANTS AND ANIMALS

Forest Vegetation: Upland, Riparian, Wetland

Upland Vegetation: General Forest Ecology Perspective

Short-term: Direct Impacts – Indirect Impacts

In the first several decades there would be little observable difference in ratios of stand conditions between the No Action Alternative and the Preferred Alternative. Compared to Alternative 3, the Preferred Alternative would have less structural diversity on harvested units, as Alternative 3 employs heavy thinning as opposed to regeneration harvests.

Long-term: Direct Impacts – Indirect Impacts

At 100 years, the differences in stand condition ratios become more apparent, with about half as much forest in the younger age classes under the Preferred Alternative as compared to the No Action Alternative. The oldest age classes are also better represented in the Preferred Alternative, with 14 percent more area in the fully functional class, compared to the No Action Alternative. The contrast with Alternative 3 is more striking in the long term, due to the much lower frequency of entry, higher structural diversity due to leaving 25 percent of the trees in harvested units, and greater proportion of older forest due to much wider riparian buffers in Alternative 3.

Cumulative Impacts

Cumulative impacts are related to frequency of entry into the stands, and are unlikely to be much different from the No Action Alternative. They would be greatly reduced in Alternative 3, however, due to the longer rotation length and consequent reduction in frequency of entry.

Mitigation – Landscape Plan Proposal

Mitigation under the Preferred Alternative would be the same as for the No Action Alternative.

Unavoidable adverse impacts

Nineteen fewer miles of road compared to the No Action Alternative will result in fewer road related impacts. Alternative 3 would have 29 fewer miles than the No Action Alternative, with an attending reduction in impacts compared to the other alternatives. See PDEIS page 160.

Riparian and Wetland Vegetation: General Forest Ecology Perspective

Short-term: Direct Impacts – Indirect Impacts

Under the Preferred Alternative, buffering of headwater streams will have a direct impact on those streams located within timber sales harvested in the first decade, potentially benefiting temperatures, water quality, riparian vegetation, soils and hydrology, compared to the No Action Alternative. Associated riparian wetlands would also benefit. Indirect impacts could arise from additional restrictions around unstable slopes, potentially averting management-triggered landslides that could dam, bury or degrade streams and wetlands. Alternative 3 would offer much more protection in the form of wider buffers for all streams, less frequent entries, stiffer restrictions on unstable slopes and buffers for small wetlands.

Long-term: Direct Impacts – Indirect Impacts

Long-term impacts would be the same as the short-term impacts, but would include all headwater streams. Buffers of headwater streams would eventually contribute large woody

debris to the stream channels, affecting water routing, channel morphology, sediment transport and vegetation establishment.

Cumulative Impacts
Buffers on headwater streams may contribute over time to the general functional stability of the forest, but there is insufficient information to evaluate this. For isolated wetlands, cumulative effects under the Preferred Alternative would be the same as for the No Action Alternative. Small isolated wetlands and all streams would fare better under Alternative 3, due to the buffers provided.

Mitigation – Landscape Plan Proposal
Mitigation measures will be the same as for the No Action Alternative, except that head water streams will already receive protection through the buffers, and in many cases will not require additional measures. The same measures would be useful under Alternative 3, but with less frequent need, due to more protective buffers.

Unavoidable adverse impacts
Unavoidable adverse impacts to small wetlands which might escape notice during the timber sale planning process would be the same under all three alternatives. Impacts to such wetlands could range from temporary disturbance of vegetation to severe disruption of hydrology resulting in long-term loss of acreage and function.

Forest Health: Insects and Disease
Short-term: Direct Impacts – Indirect Impacts
Douglas-fir beetle breeds in fallen or stressed large-diameter Douglas-fir. When beetle populations are high, the beetles can attack and kill otherwise healthy Douglas-fir trees. Activities that produce large pulses of large diameter Douglas-fir trunks promote bark beetle populations. Scenarios that increase risk of unacceptable Douglas-fir beetle activity are possible under the Preferred Alternative.

Long-term: Direct Impacts – Indirect Impacts
The Preferred Alternative will likely result in increased forest insect and disease activity relative to the No Action Alternative due to the general maturation of the forest and reduced opportunity to enter and manipulate tree vigor and stand composition (approximately 95 acres treated per year vs. approximately 150 acres treated per year). These insect and disease activity levels will not threaten ecosystem function. Logs and snags will increase, potentially to the benefit of water quality and soil productivity. Over time stands will shift toward late seral conditions, becoming more prone to insect and disease activity.

Cumulative Impacts
No cumulative impacts were identified.

Mitigation – Landscape Plan Proposal
Douglas-fir beetle: This alternative specifies that trees cut for yarding corridors through Type 5 riparian management zones shall be retained as down wood and that at least 8 trees per acre be left as legacy trees. If more than an average of five large (>12”DBH) Douglas-fir per acre over a 10 acre or smaller area, in other words, approximately 50 Douglas-fir greater than 12” diameter

on ten acres or less are felled or windthrown and intended to be left more than one year, then precautions should be undertaken to prevent Douglas-fir beetle population buildup. Options include leaving fewer fresh Douglas-fir logs in a given year; leaving species other than Douglas-fir, applying beetle pheromones to the freshly fallen trees/logs so they do not become infested.

In areas where people work, concentrate, or recreate, hazardous trees and snags should be evaluated and monitored. Action should be taken to reduce safety risks.

In the most extreme potential case of an aggressive, exotic pest being detected in the Lake Whatcom landscape, not unlikely due to proximity to Bellingham and Vancouver Ports, the Washington State Department of Agriculture could obtain legal access and use aerially-applied chemical tools in this watershed regardless of local preferences or policy. Therefore this policy does not put the larger ecosystem at risk from some exotic pests.

The Preferred Alternative specifies a commercial forest productivity strategy requiring reforestation with a majority of Douglas-fir intermixed with Western redcedar. Although that will be the most desirable species mix on much of the forest, on some sites other species or ratios are more appropriate. The DNR Forest Entomologist has suggested that guidance be given to "Select a harvest method *and reforestation prescription* that maintains or facilitates establishment of productive and healthy forest stands" and that foresters be given sufficient flexibility to choose to plant alternate species if needed; for example; western white pine or alder in areas with laminated root rot, or Sitka spruce in areas where it is depleted from historic levels.

Unavoidable adverse impacts
This alternative specifies that there will be no aerial application of herbicides or fertilizer. Control of competing vegetation and or noxious weeds could potentially be much more expensive. Opportunities for fertilizing to improve tree growth will likely be forsaken. The inter-jurisdictional committee review process for chemical pesticide use (fungicides and insecticides) provides more options than a complete ban.

Rare and Sensitive Plants
See Affected Environment: Rare and Sensitive Plants. The only records for rare and sensitive plants in the planning unit are for two populations of the aquatic herb Lobelia dortmanna, from the shores of Lake Whatcom in the 1930s and 1960s. All three of the alternatives discussed in this DEIS would tend to slightly reduce nutrient levels in the lake over time by increasing large woody debris in streams, which could act as a sediment barrier. This could potentially be a slight benefit to L. dortmanna, if it still inhabits the lake. It is unlikely that forest practices activities conducted through any of the alternatives would have any impact on L. dortmanna populations.

Animals
Individual Animal Species
The same species-specific protection identified under the No Action Alternative applies to the Preferred Alternative.

Short- and Long-term Impacts: Direct & Indirect
Short-term direct impacts of the Preferred Alternative would be similar to those of the No Action Alternative, with the exception that road construction and regeneration harvest would occur in

fewer areas of the planning area. The Preferred Alternative would be expected to improve short- and long-term protection of amphibian habitat (especially for the tailed frog and other species that use headwater streams), due to buffering on *all* streams, including Type 5 streams. Buffers on headwater streams may be instrumental in maintaining populations of amphibians associated with riparian habitat in closed-canopy forests (Corn and Bury 1989, Hagar 1999, Jackson 2002, Jackson et al. 2001, Kauffman et al. 2001, O'Connell et al. 1993, Vesely 1997).

Information on the effectiveness of different types and sizes of riparian buffers for protecting amphibian populations is currently lacking in the literature. However, it has been shown that headwater streams provide primary habitat for some amphibian species, and that even small buffer strips on such streams can protect habitat and water quality (Bury and Corn 1988, Corn 1989, Cross 1985, Gomez 1992).

The Preferred Alternative would still be expected to result in rapid hardwood conversion and resulting loss of habitat for species associated with hardwood stands, due to the strategy under Objective Number 12 which states "during the first two decades of the landscape plan, accelerate the harvest of mature and over mature hardwood stands on sites better suited for conifers." However, increased restrictions resulting in areas of probable inaccessibility would likely leave some areas of hardwood stands unmanaged. In addition, the Preferred Alternative would result in a greater retention of ground vegetation and shrubby plants that are important habitat components for a number of species (especially insects and birds). This would be a secondary result of restrictions (added for the Preferred Alternative) on the aerial application of herbicides, as well as the potential for site-specific recommendations following inter-jurisdictional committee review of vegetation control involving pesticides.

A long-term direct impact of the Preferred Alternative would be a greater decline (than for the No Action Alternative) in early seral stages on the landscape, and a more pronounced shift to mature forests (close and complex seral stages, with a slightly higher increase in "old-growth", or "fully functional" seral stage). The Preferred Alternative would retain more undisturbed areas for species associated with older, interior forest. There would also be potential for forest stand characteristics to develop that would be more conducive to marbled murrelet nesting.

Under the Preferred Alternative, Life Form 8 would experience both short-term and long-term declines in suitable and primary habitats, with a greater loss of habitat than under the No-Action Alternative. Life Forms 10 and 11 would be expected to experience a short-term decrease in habitat, as with the No Action Alternative, but the long-term trend differs from it, with a projected increase in both types of habitat. Under the Preferred Alternative, Life Forms 13 and 14 are projected to have slightly higher short-term increases and much larger long-term increases in habitat than under the No Action Alternative. For numerical data and greater detail, see the PDEIS, pp. 204-205.

Cumulative Impacts

The cumulative impacts from road building would be less under the Preferred Alternative. Restrictions for unstable slopes could result in contiguous blocks of forest left unaltered (at least not fragmented or otherwise affected by roads). This, in turn, could result in a higher degree of habitat suitability for interior forest species, compared to the No Action Alternative, particularly in the northeast portion of the planning area (see Map 2, Appendix C of the PDEIS). Other

portions of the planning area that would have fewer road impacts under the Preferred Alternative compared to the No Action Alternative are the middle-eastern and southeastern portions. Other cumulative impacts listed under the No Action Alternative would be expected to occur, but to a lesser extent, under the Preferred Alternative.

Mitigation – Landscape Plan Proposal
Same as the No Action Alternative, although less mitigation would be needed due to fewer acres being harvested and fewer roads being constructed.

Unavoidable adverse impacts
Similar to the No Action Alternative although likely to a lesser extent.

Fish
Habitat Quality
The Preferred Alternative is more protective of riparian ecosystem functions than the No Action Alternative. It provides RMZs on all water types, including a 33-foot wide RMZ on Type 5 waters. This alternative provides careful regulation of timber harvest and road construction on potentially unstable slopes. The Preferred Alternative should maintain a high level of riparian function, and protect the stream channel from sedimentation caused by upslope landslide failures.

This alternative is more protective of riparian ecosystem function than the No Action Alternative because it does not allow harvest in a Type 5 RMZ except for roads and yarding corridors. However, harvesting in any RMZ under either the No Action Alternative or the Preferred Alternative would be consistent with the principles and requirements of DNR's HCP.

Activities proposed within RMZs and wetlands will be reviewed by the interjurisdictional committee, who may make site-specific recommendations.

DNR is encouraged to avoid harvest in wetlands, consistent with current practice. No harvest will occur within the channel migration zone on Type 1-4 waters.

The Preferred Alternative calls for completion of all identified road maintenance and abandonment work within four years of Board of Natural Resources approval of the landscape plan, reducing the risk of sedimentation.

Short-term and Long-term: Direct Impacts – Indirect Impacts
No probable, significant adverse impacts are identified. The Preferred Alternative will increase protection to riparian function and in-stream fish habitat.

Cumulative Impacts
Same as the No Action Alternative

Unavoidable adverse impacts
Same as the No Action Alternative.

Habitat Accessibility
Same as the No Action Alternative.

ENERGY AND NATURAL RESOURCES

Energy Resources (Coal, Oil, Gas, Hydropower)

Coal
Short-term Impacts
No change from the No Action Alternative.

Long-term Impacts
There is no current coal activity in the landscape planning area and therefore no impact. Long-term direct or indirect impacts could occur if leasing were to proceed in the future. Any proposed activity in areas of unstable slopes would be regulated under the HCP, Forest Practices Rules, and Forests and Fish.

Cumulative Impacts
There is no current coal activity in the landscape planning area. Cumulative impacts could occur if leasing were to proceed in the future. Any proposed activity in areas of unstable slopes would be regulated under the HCP, Forest Practices Rules, and Forests and Fish.

Additional Mitigation Measures
No change from No Action Alternative.

Unavoidable Adverse Impacts
No change from No Action Alternative.

Oil and Gas
Short-term: Direct Impacts – Indirect Impacts
No short-term oil and gas leasing impact, as the one active lease in the landscape management area has a no surface occupancy provision. No change from the No Action Alternative.

Long-term: Direct Impacts – Indirect Impacts
Long-term direct impacts from oil and gas leasing activity within the landscape planning area are limited by the strategy to allow leasing with a non-surface occupancy provision for state land within the landscape management area. This provision limits exploration activities such as drilling and possible road maintenance activities for geophysical surveys to adjoining non-state parcels. Oil and/or gas development activities, if compatible with landscape objectives, would only be from the subsurface.

Cumulative Impacts
Same as the No Action Alternative.

Mitigation – Landscape Plan Proposal
Same as the No Action Alternative.

Unavoidable adverse impacts
Same as the No Action Alternative.

Mineral Resources
Sand, Gravel, Rock, Metals
All the impacts for the Preferred Alternative for sand, gravel and rock are the same as those for the No Action Alternative. There are no impacts regarding metallic minerals or industrial minerals.

Forest Resources (Timber, Special Forest Products)
Timber Resources
Under the Preferred Alternative, approximately 53 percent, or 8,276 acres, will be available for harvest. The annual harvest is about half of that under the No Action Alternative.

Short-term: Direct Impacts – Indirect Impacts
Sufficient acreage and volumes would be available to support immediate harvest operations. Lack of vehicular access to some areas will reduce options for method of logging. Portions of the project area will be inaccessible to harvest, as landings suitable to helicopter operations will not be available.

Long-term: Direct Impacts – Indirect Impacts
Average, minimum rotation age would be age 60, identical to the No Action Alternative. The average site index of lands available for harvest would be slightly reduced. Stands dominant to Douglas-fir will continue to be maintained. The availability of red alder of commercial size will decrease over time and stands with higher levels of hemlock and cedar will increase.

Cumulative Impacts

Table 6: Cumulative Impacts on Timber Harvest
Cumulative impacts of each alternative on the availability of acreage open to commercial harvests, average annual harvests, average harvest volumes per acre and the annual acreage treated as regeneration, thinning and partial cut harvests.

	No Action Alternative	Preferred Alternative	Alternative 3
Acres available for harvest or restoration activities	11,390	8,276	5,475
Percentage of 15,707-acre planning area	73	53	35
Draft average annual harvest volume (thousand board feet/year)	5,511	2,733	492
Draft average harvest volume (thousand board feet /acre)	37	30	9
Draft annual acreage treated as regeneration harvests	89	43	0
Draft average annual acreage treated as thinning harvests	47	35	18
Draft annual average acreage treated as partial cut harvests	11	13	11

Note: The numbers in this table are approximate, resulting from modeling analysis, and used for comparative evaluation for planning purposes only. (Source: Road Summary, Stuart, 2003; Comparison of February 02 Sustainable Harvest Model Run, Brodie, 2002.)

Mitigation – Landscape Plan Proposal
Unknown at this time.

Unavoidable adverse impacts
Under any type of logging method, adverse impacts to soil and water quality can occur. All harvest practices can increase the potential for windthrow.

Special Forest Products
Short-term: Direct Impacts – Indirect Impacts
The Preferred Alternative provides reasonable access to a large part of the planning area for commercial harvesting of special forest products, but less so than the No Action Alternative.

Long-term: Direct Impacts – Indirect Impacts
The types of products available are likely to be highest under the Preferred Alternative as the variety of stands in different ages and vegetative stages would be greatest. Roughly half the project area would be closed to harvest allowing vegetation and fungal species associated with late seral forests to develop. Areas open to harvest would produce special forest products associated with higher levels of sunlight and open ground.

Cumulative Impacts
Primary impacts would be financial in that the potential for revenue would probably be higher than that of the No Action Alternative.

Mitigation – Landscape Plan Proposal
Unknown at this time.

Unavoidable adverse impacts
Possible conflicts with Native American traditional uses of medicinal plants may impact any commercial harvesting.

Carbon Sequestration
See the Comparison of Alternatives and DEIS Appendix D for a more complete discussion of carbon sequestration. The Preferred Alternative would likely be less favorable for sequestering carbon than the No Action Alternative. Though the average rotation age under these alternatives is identical, the number of acres available for harvest is lower under the Preferred Alternative. With reduced harvest activity there will be fewer young trees, which store more carbon than older trees on an annual basis, though the amount of stored forest carbon may increase over time beyond what is captured in the No Action Alternative.

Built Environment

ENVIRONMENTAL HEALTH

Release of Toxics/Hazardous Materials
No significant adverse impacts are likely.

Risk of Explosion/Fires
There is very limited risk of explosions on DNR-managed lands within the Lake Whatcom Planning Area. No pipelines cross the planning area nor are there any other risk factors.

As discussed in the Air section, past wildfire history (very few fires, each small in size) and current zoning suggest that there is a relatively low risk of fire threatening homes and other structures adjacent to state trust lands under the Preferred Alternative.

Risk of Slides, Floods, Debris Flows
Short-term and Long-term: Direct Impacts – Indirect Impacts
The potential for impacts to the built environment (local forest roads and off-site elements) from slides, floods or debris torrents as a result of implementing this alternative would be low under the Preferred Alternative. The potential for impacts would be reduced compared to the No Action Alternative because no road construction would occur on unstable slopes and almost no construction would occur on potentially unstable slopes. Further, timber harvest acreage would be reduced and harvesting on potentially unstable slopes could occur only after on-site evaluation by a DNR slope stability specialist and review by the interjurisdictional committee.

LAND & SHORELINE USE

Existing Land Use Plans/Growth Estimates
Land use plans and growth estimates are responsibilities of Whatcom County, its jurisdictions and other state agencies. They are not determined by DNR. The No Action Alternative, as well as the Preferred Alternative and Alternative 3, complies with the uses set for lands already zoned for commercial forestry. No zoning changes are anticipated as a result of this proposal.

Residential and Commercial Development
None of the three alternatives will affect residential or commercial development, which occurs only on lands not managed by the DNR.

Aesthetics
Each of the alternatives includes an objective to "reduce the visual impact of forest management activities as shown on Map S-1 (PDEIS Appendix C)." This analysis primarily considers those areas identified as having "high" and "medium" potential for visual impacts as viewed from six different residential communities. Because fewer acres will be harvested under the Preferred Alternative, reduced visual impacts would be anticipated compared to the No Action Alternative.

Under the Preferred Alternative, as well as the No Action Alternative and Alternative 3, riparian, wetland and unstable slope protection will leave an irregular visual pattern at the larger landscape scale. Limiting regeneration harvest areas to no more than 100 acres and requiring a

minimum of 300-foot separation between areas that together would exceed 100 acres also will minimize potential visual effects of management activities.

By incorporating site-specific design features in timber sale plans the department can soften visual effects in the "high potential" areas east of Cain and Reed lakes and north of Smith Creek.

Short-term: Direct Impacts
Individual timber harvest activities and some road building will likely affect residential views under all three alternatives. The impacts from harvest activities will be short-term, then the forest will re-grow. These site-specific activities are most likely to be visible in the area east of Cain and Reed lakes and north of Smith Creek.

Long-term: Direct Impacts
As new trees grow up in a harvested area another area may be cut, so there will be periodic visual changes on the horizon. The long-term forest viewshed should improve over time, however, as the HCP's riparian, wetland and unstable slope strategies are implemented. New roads, if visible, would create new, long-term visual impacts. With the information currently available it is difficult to determine how significant this impact would be.

Cumulative Impacts
Cumulative impacts should be minimal because of the dynamic nature of the forest re-growing, harvest size limits and buffers between harvest areas.

Additional Mitigation – Landscape Plan Proposal
Sale design strategies could be added during planning of timber harvests in high visibility areas to soften the visual impacts.

Unavoidable adverse impacts
Since aesthetics are subjective, not objective, it is difficult to say that no one will experience what they consider significant impacts. However, it is DNR's determination that there will be no significant adverse impacts under the Preferred Alternative, particularly if mitigation actions are taken into account in scheduling and design of timber sales.

Recreation
All three alternatives are based on a landscape plan objective to "manage dispersed, low impact recreation."

Short-term and Long-term Impacts: Direct Impacts
Access throughout the area by recreational users (horse riders, hikers, mountain bikers) will likely be diminished because of the reduced size of the active road network, compared to the No Action Alternative.

Since larger areas within the Lake Whatcom landscape will not be harvested, there will be less evidence of human impact. This would enhance the recreational experience of many users, particularly those engaged in activities such as bird watching, and berry or mushroom picking.

Recreational use will continue to be dispersed throughout the landscape under the Preferred Alternative. The level of impact created by recreational users on streams, wetlands and other public resources is not expected to increase. Enforcement needs, particularly to discourage off-road vehicle use, are expected to remain at present levels since access to much of the road system is blocked by gates in cooperation with other major landowners and the number of active road miles will lower under the Preferred Alternative than under the No Action Alternative.

Cumulative Impacts
None identified.

Mitigation – Landscape Plan Proposal
No additional measures identified as needed.

Unavoidable adverse impacts
None identified.

Historic and Cultural Preservation
The Preferred Alternative calls for DNR to develop an agreement with interested federally-recognized tribes who consider the Lake Whatcom area as part of their Usual and Accustomed Area (U&A). The development of such agreements will begin within one year of Board of Natural Resources approval of the landscape plan. The agreement will:

- Identify categories of cultural resources to be protected and specific protection requirements and/or guidelines for each category
- Outline a consultation process, including review timelines, for state lands actions such as:
  - Timber sales plans
  - Road maintenance and abandonment plans (RMAPs)
  - Land exchanges
- Address consultation process for the development of, or changes to, DNR policies such as:
  - DNR Forest Resource Plan
  - Sustainable Harvest Calculation
  - Commissioner policy(s) for working with tribes (Commissioner's Order)
  - Forest Practices
  - Other applicable policies
- Address other strategies under the objectives of this landscape plan to assure that conflicts with the protection of cultural resources are either avoided or mitigated to the extent possible.
- Address issues such as:
  - Tribal access, including behind DNR-controlled gates, to cultural sites on state lands
  - Cultural materials with significant commercial market (e.g. cedar trees for totem poles, canoes, etc.)

Prior to implementation of the agreement described above, protection of traditional cultural resources identified during harvest planning will be guided by the protection needs and comments/recommendations in the table concerning Tribal Cultural Resources in DEIS Appendix D.

As stated previously, the staff of the Washington State Office of Archaeology and Historic Preservation knows of no studies that document differences in the level of protection for case-by-case review versus more programmatic processes in the levels of protection offered to cultural resources.

Impacts to cultural resources are essentially the same under all Alternatives.

Unavoidable adverse impacts
Cultural resources (such as cultural use sites known to families or individuals) that are not identified in either the OAHP or tribal databases or are not otherwise brought to the attention of DNR may be impacted by forest practices. They would be incidentally protected by additional buffers under the Preferred Alternative and Alternative 3. In those areas available for harvest in all three alternatives, current policies enable DNR to avoid or mitigate some but not all impacts to cultural resources.

Agriculture
No change from the No Action Alternative. There are no lands within the planning area specifically designated for long-term agricultural use, although it is a permitted use for lands in Whatcom County zoned rural and rural residential.

Silviculture
Under the Preferred Alternative, approximately half the project area, 8,276, acres will be eligible for commercial harvest. This alternative does not vary significantly from the No Action Alternative regarding the ability of the department to conduct silvicultural activities on available acres.

Short-term: Direct Impacts – Indirect Impacts
Regeneration of stands will continue to emphasize current practices of artificial regeneration of Douglas-fir and western red cedar. Natural seeding will be used at higher elevations. Aggressive brush control will occur during the first 10 years.

Long-term: Direct Impacts – Indirect Impacts
Precommercial thinning will probably be employed on all stands under the Preferred Alternative. The probability of acceptable rates of return from commercial thinnings is high. Some reductions in road access will increase overall costs of silviculture treatments.

Cumulative Impacts
The ability to control stand structure, stand composition and density, control rotation length and facilitate harvesting on available acres will be very high under the Preferred Alternative but less than the No Action Alternative.

Mitigation – Landscape Plan Proposal
After a review of each site, the department selects from the following methods for controlling vegetation: no treatment, nonherbicide, and ground-applied herbicide. A method lower on the list may be used only if it substantially outperforms other methods (Forest Resource Plan Policy # 33).

Aggregated, rather than dispersed, patterns of retention increase flexibility in treatment of young stands and reduction in windthrow.

Unavoidable adverse impacts
Under any type of logging method, adverse impacts to soil and water quality can occur. All harvest practices can increase the potential for windthrow.

TRANSPORTATION

Transportation Systems (Forest Roads, Trail Systems)
Approximately 43 miles of road would be constructed under the Preferred Alternative. After abandonment of existing and constructed roads that are not needed for long-term use, a total of approximately 35 miles could be expected to remain as permanent active roads. This would provide a road density of 1.4 miles per square mile. The combination of log and rock haul would result in an average of 4 round trips per day generated by forest management activities on DNR forests in the planning area.

Easements for neighboring landowners might be prohibited or require longer road construction if unstable slopes were encountered.

Prohibiting new road construction on unstable slopes eliminates the potential for maintenance or special design requirements in those areas. Review of potentially unstable slopes by a specialist would likely reduce long-term maintenance needs.

Short- and Long-term: Direct Impacts – Indirect Impacts
Possible environmental impacts are discussed in other sections under the Natural Environment heading. No significant impacts are expected related to maintenance or traffic. The Preferred Alternative may result in a less efficient road system and may limit DNR's ability to access some areas by vehicles for harvest (potentially reducing trust revenues), immediate fire suppression, and recreational users.

Cumulative Impacts
Traffic would contribute to maintenance needs on DNR roads, private forest roads, and public highways.

Mitigation – Landscape Plan Proposal
None identified.

Unavoidable adverse impacts
Adverse impacts would be similar to those under the No Action Alternative but proportionally smaller due to the shorter length of road construction.

Traffic Hazards/Safety
The amount of hauling under the Preferred Alternative is nearly half the average under the No Action Alternative (averaging four round trips daily rather than eight). Actual hauling events will tend to be more concentrated when specific road building and harvest activities are occurring,

with almost no hauling at other times or in other parts of the landscape. No significant adverse impacts relative to traffic and safety are expected.

Forest Road Maintenance and Abandonment Plans
DNR expects to complete the assessment phase of the Road Maintenance and Abandonment Plan (RMAP) within one year after the landscape plan is adopted. Funding has been appropriated to do the necessary maintenance and abandonment work. Assuming continued funding, DNR expects to complete the work within three years after completion of the assessment phase of the RMAP. The requirements for treatment of orphaned roads are the same as under the No Action Alternative.

Short- and Long-term: Direct Impacts – Indirect Impacts
Potential impacts would be the same as under the No Action Alternative.

Cumulative Impacts
The road system requirements under the Preferred Alternative, taken in combination with unstable slopes and riparian areas differences, would have cumulative benefits to the environment, particularly fish habitat. The Preferred Alternative would also require spending more of the department's management funds on road related work in the landscape, which may limit the ability to do other critical work in this landscape or elsewhere in the state.

Mitigation – Landscape Plan Proposal
None identified.

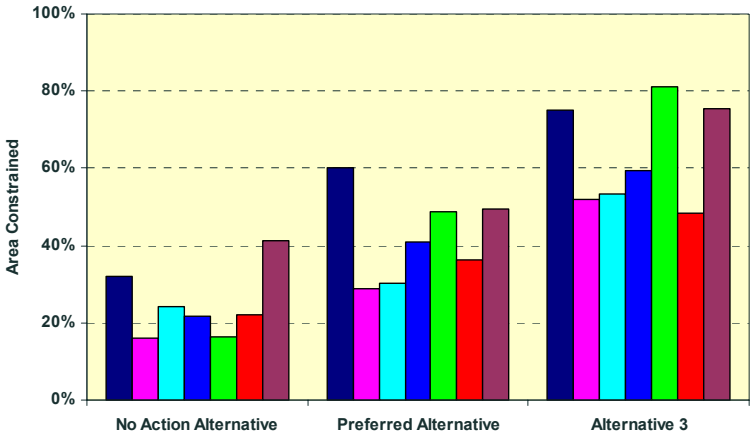
Unavoidable adverse impacts
None identified.

Water, Rail and Air Traffic
There is no significant change from the No Action Alternative. Harvest levels will be lower, but road access will also be more limited, so there may be some increase in helicopter logging.

PUBLIC SERVICES & UTILITIES

Relation to Trust Income
The Preferred Alternative dedicates 75 percent of the land's productive capacity for ecological and social benefits (Hulsey, 2002). For the percentage of land area by trust on which timber harvest is constrained for each trust under each alternative, see Figure 5.

Figure 5: Proportion of area on which timber harvest is constrained by management



Trust 1- Whatcom Co: Forest Board Transfer
Trust 1- Skagit Co: Forest Board Transfer
Trust 2- Whatcom Co: Forest Board Purchased
Trust 3: Common School (K-12)
Trust 4: Agricultural School (WSU)
Trust 7: Capitol Building
Trust 10: Scientific School (WSU)

Draft sustainable harvest calculations for Lake Whatcom suggest that the Preferred Alternative will return some $1,572,000 per year for the first two decades of the planning period ($215,000 per year less than the No Action Alternative), and $895,000 per year for the entire planning period ($809,000 per year less than the No Action Alternative). In effect, this amount would not be available for annual distribution to the state general fund for public services, or to trust beneficiaries, or to county junior taxing districts, or to the department's management funds. Further details regarding these revenue estimates are provided in Table 11 below.

Table 11: Estimated average annual harvest revenue reduction associated with choosing the Preferred Alternative rather than the No Action Alternative in the Lake Whatcom landscape and average annual revenue change relative to the No Action Alternative, by beneficiary group for the first two decades and the entire planning period (modeled at 200 years).

Beneficary entity	First two decades: Average annual revenue ($000)	First two decades: Change in average annual revenue ($000)	Entire planning period: Average annual revenue ($000)	Entire planning period: Change in average annual revenue ($000)
Whatcom County Forest Board Transfer				
Bellingham & Mt Baker School Districts	245	-33	140	-126
Bonds	80	-11	46	-41
Maintenance & operations	165	-23	94	-85
Whatcom County roads	114	-16	65	-59
Whatcom County	79	-11	45	-41
Library	27	-4	15	-14
Port of Bellingham	21	-3	12	-11
Whatcom County Conservation Futures	3	0	2	-2
State General Fund	169	-23	96	-87
DNR Forestry Development Account	186	-25	106	-96
Whatcom County Forest Board Purchased				
Bellingham & Mt Baker School Districts	13	-2	7	-7
Bonds	4	-1	2	-2
Maintenance & operations	9	-1	5	-4
Whatcom County roads	6	-1	3	-3
Whatcom County	4	-1	2	-2
Library	1	0	1	-1
Port of Bellingham	1	0	1	-1
Whatcom County Conservation Futures	0	0	0	0
State General Fund	9	-1	5	-5
DNR Forestry Development Account	35	-5	20	-18
Skagit County Forest Board Transfer				
Burlington-Edison School District	28	-4	16	-14
Bonds	13	-2	8	-7
Maintenance & operations	14	-2	8	-7
Skagit County roads	11	-2	6	-6
Skagit County	9	-1	5	-5
United General Hospital	3	0	2	-1
Port of Skagit	1	0	0	0
Skagit County Medic 1	1	0	1	-1
Skagit County Conservation Futures	0	0	0	0
State General Fund	16	-2	9	-8
DNR Forestry Development Account	19	-3	11	-10
Common School (K-12)				
Common School (K-12)	348	-48	198	-179
DNR Resource Management Cost Account	116	-16	66	-60
Agriculture School (WSU)				
Agriculture School (WSU)	19	-3	11	-10
DNR Resource Management Cost Account	0	0	0	0
Capital Buildings				
Capital Buildings	22	-3	12	-11
DNR Resource Management Cost Account	7	-1	4	-4
Scientific School (WSU)				
Scientific School (WSU)	42	-6	24	-22
DNR Resource Management Cost Account	14	-2	8	-7
TOTAL	1,572	-215	895	-809

Notes:
1: Trusts denoted in bold typeface; associated beneficiary groups denoted in regular typeface
2: Totals may not add due to rounding

Analysis was completed for carbon sequestration, green certification and recreation leasing:

Carbon sequestration: The cost of sequestering additional carbon under the Preferred Alternative is likely to exceed the cost of simply planting bare land for carbon sequestration. This prospect means returns for carbon sequestered in the Lake Whatcom landscape (if any) would probably not produce revenues sufficient to financially justify this choice (Glass, 2003).

Green certification: Whether or not certified lumber products attract a premium price in the market, any price premium associated with certified softwood lumber would have to return at least $103/Mbf to the forest grower, in order to financially justify choosing the Preferred Alternative over the No Action Alternative, because of the reduced timber harvest. It appears highly unlikely that forest growers will realize price premiums of this magnitude, especially within the context of current lumber and stumpage prices.

Recreation leasing: None of the alternatives proposes a destination resort on state trust lands near the shores of Lake Whatcom. However, because this would generate some of the highest recreation returns, it was used as a test case, to see if recreation income could effectively offset reductions in timber revenues. Estimated lease revenues from a hypothesized destination resort development on the shores of Lake Whatcom are unlikely to completely offset timber harvest revenues foregone under the Preferred Alternative.

Finally, it appears highly unlikely that combined revenues from carbon sequestration, certified lumber production and leasing of trust land for recreation activities could financially justify the choice of the Preferred Alternative over the No Action Alternative.

Fire

Short-term and Long-term: Direct Impacts – Indirect Impacts

The risk of fire is relatively low, and unchanged from the No Action Alternative. Short-term direct impacts of fire on DNR-managed lands include damage to the forest itself, risk of damage to neighboring properties, loss of habitat and potentially increased risks to water quality. In both the short and long term, fires pose potential loss of trust assets in the form of timber and other forest products, and the associated reduction in income potential for federally granted trusts, as well as for counties should Forest Board lands be damaged by fire. Fire damage also could negatively affect aesthetics, both from the standpoint of views and by diminishing the desirability of the Lake Whatcom area for recreational use.

Police

No change from the No Action Alternative

Schools

Short-term and Long-term: Direct Impacts – Indirect Impacts

The reduced timber harvest level would result in smaller revenue contributions to the Common School Construction Account, Bellingham and Mount Baker School Districts, and to the state general fund, which could reduce the amount of legislative funding available for both K-12 school construction and renovation and other education related needs.

Parks and Recreation Facilities
No change from the No Action Alternative. There are no parks or developed recreation facilities located on DNR trust lands. No direct impacts are expected to facilities located on adjacent public or private lands.

Communications
No change from the No Action Alternative. The Preferred Alternative neither impacts communication site leases nor limits new site opportunities. DNR would continue to lease communication tower and building space, increase rental rates as market conditions allow, and seek new customers.

Water/storm Water Management
There are no probable significant impacts to bridges or the Brannian Creek fish hatchery water intake from peak flows under the preferred alternative.

Sewer/Solid Waste Management
No change from the No Action Alternative. Since most DNR-managed lands in the planning area are designated for commercial forest uses there has been no need for sewer or solid waste planning. Solid waste management has been limited to cleanup of unauthorized garbage dumping.

Alternative 3

Natural Environment

EARTH
Approximately 5,475 acres of the 15,707 acres of trust land in the planning area would be available for timber harvesting under Alternative 3. No harvesting would occur on 5,590 acres of unstable slopes and associated buffers except for minor removals in the outer 50 feet of the buffers to achieve "edge feathering." There would be 1,131 acres of riparian buffer and 930 acres of wind buffer. Approximately 700 acres have been identified as possibly inaccessible for harvesting under this alternative.

About 33 miles of new road would be constructed during the next 140 years. No road construction would occur on unstable or potentially unstable slopes. An average of 29 acres – all in thinnings or partial-cuts – would be harvested annually.

Unstable Slopes
Short-term: Direct Impacts – Indirect Impacts
The potential for slope failures to occur as a result of new road construction would be minimal since no roads would be constructed on unstable slopes and virtually none would be constructed on potentially unstable slopes. This would be a reduction in potential for slope stability related impacts compared to the No Action Alternative but essentially no change from the Preferred Alternative.